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DEFENSE LOGISTICS AGENCY (DLA)

21.2 SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM

Proposal Submission Instructions

GENERAL

The Defense Logistics Agency (DLA) implements, administers, and manages the SBIR/STTR Program as part of the Small Business Innovation Programs through DLA J68 Information Operations / Research, and Development (R&D) Division. Consult the program website at the following location: <http://www.dla.mil/SmallBusiness/SmallBusinessInnovationPrograms> for general information about the DLA SBIP Program and its mission. If you have any questions regarding the administration of the Program or these proposal preparation instructions, please contact the DLA SBIR Program Manager (PM):

Denise Price email: DLASBIR2@dlamail.mil

TECHNICAL QUESTIONS

For questions regarding the SBIR/STTR topics during the pre-release period, contact the Topic Technical Point of Contact (TPOC) listed for each topic on the DSIP website at <https://www.dodsbirsttr.mil/submissions/login> prior to the close of the pre-release. To obtain answers to technical questions during the open period; submit your questions through the online DSIP Topic Q&A System <https://www.dodsbirsttr.mil/submissions/login>.

For questions regarding the DoD SBIR/STTR electronic submission system, contact Department of Defense (DoD) SBIR Help Desk at DoDSBIRSupport@reisystems.com.

PHASE I KEY DATES The Dates and times on <https://www.dodsbirsttr.mil/submissions/login> are official.

Complete proposals must be submitted on or before the date published in the DoD 21.2 SBIR BAA.

PROGRAM BROAD AGENCY ANNOUNCEMENT (BAA) 21.2

PHASE I GUIDELINES

DLA is committed to improving the time to award new projects. As such, all DLA Phase I topics are subject to pilot efforts intended to meet legislative goals.

All selections recommended award may be subject to an Oral presentation prior to the final award.

A list of the topics currently eligible for proposal submission is included in the Topic Index, followed by full topic descriptions. Additional guidance is as follows:

- Proposal period of performance should follow the guidelines listed in the topic.
- Proposal Cost Estimates are topic dependent, and each topic has a specified ceiling.
- Phase I proposals may not exceed the 20-page limit.
- Volume 5 Proposal attachments, appendices, or references are not included in the Page count.

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- Volume 6 FWA Training Certificate is required for proposal submission.
- The PI and CO listed in the Proposal will receive notification of selection or non-selection electronically via e-mail (NLT 90 days from the closing date of this BAA). The Notification will include the debrief comments.

For detailed proposal submission guidance, refer to U.S. Department of Defense (DoD) Instructions 21.2 SBIR at: <https://www.dodsbirsttr.mil/submissions/login>

Phase I Proposal Instructions

a. **Proposal Cover Sheet (Volume 1)**

All DLA proposals must be submitted to the Defense SBIR/STTR Innovation Portal (DSIP) located at <https://www.dodsbirsttr.mil/submissions/>. If your proposal is selected for award, the technical abstract and discussion of anticipated benefits may be publicly released on the Internet. Once the Cover Sheet is saved, the system will assign a proposal number. You may modify the cover sheet as often as necessary until the BAA closes.

b. **Format of Technical Volume (Volume 2)**

The format and specific details of the Phase I proposal Volume 2 are included in the DoD BAA Preface.

c. **Content of the Cost Volume (Volume 3)**

Complete the Cost Volume by using the DLA provided template which is available on the DSIP Site.

d. **Company Commercialization Report (Volume 4)**

CCR is required to be submitted with proposals in response to DLA SBIR topics. Please refer to the current DoD SBIR BAA for full details.

e. **Supporting Documents (Volume 5)**

The use of Volume 5 is Optional. Volume 5 is provided for small businesses to submit additional documentation to support the Technical Volume (Volume 2), and the Cost Volume (Volume 5).

Documents that are acceptable and may be included in Volume 5 are:

1. Letters of Support
2. Additional Cost Information
3. Funding Agreement Certification
4. Technical Data Rights (Assertions)
5. Lifecycle Certification
6. Allocation of Rights
7. 15 Page Power Point Presentation (If Applicable)
8. Other

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f. **Fraud, Waste and Abuse Training (Volume 6)**

Fraud, Waste and Abuse (FWA) training is required for Phase I and Direct to Phase II proposals. Please refer to the current DoD SBIR BAA for full details.

PHASE II GUIDELINES

Phase II eligibility is based on the following guidance:

- All Phase I awardees may submit a Phase II proposal without invitation.
- Use the Phase I Template as a guideline with these exceptions.
 - Proposal period of performance not to exceed 24 months, this should include a base with an option period.
 - Volume 2 of Phase II proposals may not exceed the 40-page limit.
 - Volume 5 Proposal attachments, appendices, or references are not included in the 40-Page count.
 - Commercialization Strategy Requirements:
 - Business Case highlighting benefits to the DoD/DLA.
 - Transition Strategy and Key Tasks
 - Time-Phased Transition Plan
 - Projected Transition Cost Analysis

EVALUATION CRITERIA

Phase I and Phase II proposals will be evaluated based on the criteria outlined in the current DoD SBIR BAA.

Final Selection may require an oral presentation. This may include an in-person meeting or a Zoom.gov meeting.

The two-part evaluation process is explained below:

Part I: The evaluation of the Technical Volume will utilize the Evaluation Criteria provided in Section 6.0 of the DoD SBIR 21.2 BAA. Once the evaluations are complete, all Offerors will be notified as to whether they were selected to present the slide deck portion of their proposal within 30 days of the BAA close date.

Part II: If selected for an oral presentation, Offerors shall submit a slide deck not to exceed 15 PowerPoint slides to DLASBIR@dlamail.mil.

- There are no set format requirements other than the 15-page maximum page length.
- It is recommended (but not required) that more detailed information is included in the technical volume and higher-level information is included in the slide deck.

Selected Offerors will receive an invitation to present a slide deck (15-minute presentation time / 15-minute question and answer) in a technical question and answer forum to the DLA evaluation team via electronic media. The tentative date for the presentations is 1 Sept 2021. This presentation will be evaluated by a panel against the criteria listed under Section 6.0 of the DoD SBIR 21.2 BAA.

Notification of the selection/non-selection decision will occur NLT the next day.

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Input on technical aspects of the proposals may be solicited by DLA from non-Government consultants and advisors who are bound by appropriate non-disclosure requirements. Non-Government personnel will not establish final assessments of risk, rate, or rank Offeror's proposals. Further, these advisors are expressly prohibited from competing for DLA SBIR awards.

All administrative support contractors, consultants, and advisors having access to any proprietary data will certify that they will not disclose any information pertaining to this announcement, including any submission, the identity of any submitters, or any other information relative to this announcement; and shall certify that they have no financial interest in any submission. Submissions and information received in response to this announcement constitutes the Offeror's permission to disclose that information to administrative support contractors and non-Government consultants and advisors.

TECHNICAL AND BUSINESS ASSISTANCE (TABA)

The DLA SBIR Program does not participate in the Technical and Business Assistance (formally the Discretionary Technical Assistance Program). Contractors should not submit proposals that include Technical and Business Assistance.

DELIVERABLES / REPORTS

All DLA SBIR and STTR awardees are required to submit reports in accordance with the deliverable schedule. The recipient must provide all reports to the individuals identified in Exhibit A of the contract. Milestones: Each phase of the project will be milestone driven. The Principal Investigator will propose milestones prior to starting any phase of the project.

Phase I Proposals should anticipate a combination of any or all the following deliverables:

- Plan of Action and Milestones (POAM) with sufficient detail for monthly project tracking.
- Initial Project Summary: one-page, unclassified, non-sensitive, and non-proprietary summation of the project problem statement and intended benefits (must be suitable for public viewing).
- Monthly Status Report. A format will be provided at the PAC.
- The TPOC and PM will determine a meeting schedule at the PAC. Phase I awardees can expect Monthly (or more frequent) Project Reviews C)
- Draft Final Report including major accomplishments, business case analysis, commercialization strategy, transition plan with timeline, and proposed path forward for Phase II.
- Final Report including major accomplishments, business case analysis, commercialization strategy and transition plan with timeline, and proposed path forward for Phase II.
- Final Project Summary (one-page, unclassified, non-sensitive and non-proprietary summation of project results, high resolution photos or graphics intended for public viewing)
- Phase II Proposal is optional at the Phase I Awardee's discretion (as Applicable)
- Applicable Patent documentation
- Other Deliverables as defined in the Phase I Proposal

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Phase II Proposals should anticipate a combination of any or all the following deliverables:

- Plan of Action and Milestones (POAM) with sufficient detail for monthly project tracking
- Initial Project Summary: one-page, unclassified, non-sensitive, and non-proprietary summation of the project problem statement and intended benefits (must be suitable for public viewing)
- Monthly Status Report. A format will be provided at the PAC.
- Meeting schedule to be determined by the Technical Point of Contact (TPOC) and PM at the PAC
 - Phase II awardees expect Monthly (minimum) Project Reviews (format provided at the PAC)
- Draft Final Report including major accomplishments, commercialization strategy and transition plan and timeline.
- Final Report including major accomplishments, commercialization strategy, transition plan, and timeline.
- Final Project Summary (one-page, unclassified, non-sensitive and non-proprietary summation of project results, non-proprietary high-resolution photos, or graphics intended for public viewing)
- Applicable Patent documentation.
- Other Deliverables as defined in the Phase II Proposal.

PHASE III GUIDELINES & INSTRUCTIONS

Phase III is any proposal that “Derives From”, “Extends” or Completes a transition from a Phase I or II project. Phase III proposals will be accepted after the completion of Phase I and or Phase II projects.

There is no specific funding associated with Phase III, except Phase III is not allowed to use SBIR/STTR coded funding. Any other type of funding is allowed.

Phase III proposal Submission. Phase III proposals are emailed directly to DLA SBIR2@dla.mil. The PMO team will set up evaluations and coordinate the funding and contracting actions depending on the outcome of the evaluations. A Phase III proposal should follow the same format as Phase II for the content, and format. There are, however, no limitations to the amount of funding requested, or the period of performance. All other guidelines apply. More specific Instructions may be available when a firm submits a Phase III proposal

PRE-RELEASE COMMUNICATION: During the pre-release period it is highly recommended that applicants communicate with the Technical Points of Contacts (TPOCs) provided in this topic. Best method of scheduling the dialogue is via e-mail.

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DLA 21.2 SBIR Phase I Topic Index

DLA212-001	Engaging the Manufacturing Industrial Base in Support of DLA's Critical Supply Chains
DLA212-002	Unique Identifier Tags for Supply Chain Tracking Modernizations for Mark 39 Expendable Mobile Anti-Submarine Warfare (ASW) Training Target (EMATT)
DLA212-003	Thermoplastic forming of metallic glasses
DLA212-004	Rare Earth Metals Production
DLA212-005	Enhancing the separation technology to recover rare earths (REs) from chemical concentrates or industrial waste feedstock
DLA212-006	Automation-Robotics to support/supplement Dining Facilities
DLA212-007	Research and Testing of a Robotic Arm Embedded with Artificial Intelligence (AI) for use within Defense Logistics Agency (DLA) Distribution Center Warehouses

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DLA212-001 TITLE: Engaging the Manufacturing Industrial Base in Support of DLA's Critical Supply Chains

RT&L FOCUS AREA(S): Nuclear; General Warfighting Requirements (GWR)

TECHNOLOGY AREA(S): Ground Sea; Nuclear; Weapons; Materials; Air Platform

The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), 22 CFR Parts 120-130, which controls the export and import of defense-related material and services, including export of sensitive technical data, or the Export Administration Regulation (EAR), 15 CFR Parts 730-774, which controls dual use items. Offerors must disclose any proposed use of foreign nationals (FNs), their country of origin, the type of visa or work permit possessed, and the statement of work (SOW) tasks intended for accomplishment by the FN(s) in accordance with section 3.5 of the Announcement. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws.

OBJECTIVE: Expand the Small Business Manufacturer (SBM) base to address the Agency's need to develop qualified sources of supply to improve DLA product availability, provide competition for reduced lead time and cost, as well as address lifecycle performance issues. Through participation in DLA SBIR, SBMs will have an opportunity to collaborate with DLA Weapons System Program Managers (WSPMs) and our customer Engineering Support Activities (ESAs) to develop innovative solutions to DLA's most critical supply chain requirements. In the end, the SBM benefits from the experience by qualifying as a source of supply as well as from the business relationships and experience to further expand their product lines and readiness to fulfill DLA procurement requirements.

DESCRIPTION: Competitive applicants will have reviewed the parts list provided on DLA Small Business Innovation Program (SBIP) site, (Reference 4) as well as the technical data in the cFolders of DLA DiBBs, (Reference 3). Proposals can evolve in one of four ways depending on the availability of technical data and NSNs for reverse engineering as follows. Information on competitive status, RPPOB, and tech data availability will be provided on the website, Reference

- a. Fully Competitive (AMC/AMSC-1G) NSNs where a full technical data package is available in cFolders. The SBM proposal should reflect timeline, statement of work and costs associated with the manufacturing and qualification of a representative article.
- b. Other than (AMC/AMSC-1G) NSNs where a full Technical Data Package (TDP) is available in cFolders. These items may also require a qualification of a Representative Article. The SBM proposal should reflect timeline, statement of work, and costs associated with producing a Source Approval Request (SAR) and (if applicable) qualification of a Representative Article. Contact the TPOC if necessary. The scope and procedures associated with development of a SAR package are provided in Reference 1.
- c. Repair Parts Purchase or Borrow (RPPOB) may be an option for other than 1G NSNs where partial or no technical data is available in cFolders. NSNs, if available, may be procured or borrowed through this program for the purposes of reverse engineering. The instructions for RPPOB can be found on the websites, Reference 5. The SBM proposal should reflect timeline, statement of work and costs associated with the procuring the part and reverse engineering of the NSN. Depending on complexity, producing both the TDP and SAR package may be included in Phase I.
- d. Reverse Engineering (RE) without RPPOB is when the NSN will be provided as Government Furnished Material (GFM) if available from the ESA or one of our Service customers. In this case,

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contact the TPOC to discuss the availability of the NSN prior to starting the proposal. The SBM proposal should reflect timeline, statement of work and costs associated with the reverse engineering of the NSN and depending on complexity producing a TDP and SAR package in Phase I.

Specific parts may require minor deviations in the process dependent on the Engineering Support Activity (ESA) preferences and requirements. Those deviations will be addressed post award.

PROJECT DURATION and COST:

PHASE I: NTE 12 Months \$150K- Base NTE \$100K base 6 Months, Option 1 NTE \$50K base 6 Months. All work should be planned to be completed during the base period. Our intent of the option is to cover unforeseen testing requirements or circumstances that arise during the course of base execution.

PHASE II: Phase II – NTE 24 Months \$1.6M - Base 18 months, \$1M Option 6 Months NTE \$.6M
PERIOD OF PERFORMANCE: The phase one period of performance is not to exceed 12 months total. However, the project schedule should plan to complete the TDP and SAR in the first six months. The options need to be reserved for lead time for TDP and SAR approval and or representative article manufacturing and qualification. Options are not automatic. Approval is at the discretion of the DLA SBIP Program Manager. The decision is based on Project Performance, Priorities of the Agency, and/or the availability of funding.

Participating small businesses must have an organic manufacturing capability and a Commercial and Government Entity (CAGE) code and be Joint Certification Program (JCP) certified in order to access technical data if available.

Refer to “link 2” below for further information on JCP certification. Additionally, small businesses will need to create a DLA’s Internet Bid Board System (DIBBS) account to view all data and requirements in C Folders.

Refer to “links 3 and 4” below for further information on DIBBS and C Folders. All available documents and drawings are located in the C Folder location “SBIR203C”. If the data is incomplete, or not available, the effort will require reverse engineering.

PHASE I: The goal of phase I is for the SBM to qualify as a source of supply for the DLA NSN(s) to improve DLA NSN availability, provide competition for reduced lead time and cost, and address lifecycle performance issues. In this phase, manufacturers will request TDP/SAR approval from the applicable Engineering Support Activity (ESA), if required, for the NSN(s). At the Post Award Conference, the awardee will have the opportunity to collaborate with program, weapon system, and/or engineering experts on the technical execution and statement of work provided in their proposal. All Phase I Proposals should demonstrate an understanding of the NSN(s) and the general challenges involved in their manufacture. Proposals that fail to demonstrate knowledge of the part will be rejected.

PHASE II: The Phase II proposal is optional for the Phase I awardee. Phase II selections are based on Phase I performance, SBM innovation and engineering capability and the availability of appropriate requirements. Typically the goal of Phase II is to expand the number of NSNs and/or to build capability to expand capacity to better fulfill DLA requirements.

PHASE III DUAL USE APPLICATIONS: Phase III is any proposal that “Derives From”, “Extends” or Completes a transition from a Phase I or II project. Phase III proposals will be accepted after the completion of Phase I and or Phase II projects.

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There is no specific funding associated with Phase III, except Phase III is not allowed to use SBIR/STTR coded funding. Any other type of funding is allowed.

Phase III proposal Submission. Phase III proposals are emailed directly to DLA SBIR2@dla.mil. The PMO team will set up evaluations and coordinate the funding and contracting actions depending on the outcome of the evaluations. A Phase III proposal should follow the same format as Phase II for the content, and format. There are, however, no limitations to the amount of funding requested, or the period of performance. All other guidelines apply.

COMMERCIALIZATION: The SBM will pursue commercialization of the various technologies and processes developed in prior phases through participation in future DLA procurement actions on items identified but not limited to this BAA.

REFERENCES:

1. DLA Aviation SAR Package instructions. DLA Small Business Resources: <http://www.dla.mil/Aviation/Business/IndustryResources/SBO.aspx>
2. JCP Certification: <https://public.logisticsinformationservice.dla.mil/PublicHome/jcp>
3. Access the web address for DIBBS at <https://www.dibbs.bsm.dla.mil>, then select the “Tech Data” Tab and Log into c-Folders. This requires an additional password. Filter for solicitation “SBIR211A”
4. DLA Small Business Innovation Programs web site: <http://www.dla.mil/SmallBusiness/SmallBusinessInnovationPrograms>
5. DLA Aviation Repair Parts Purchase or Borrow (RPPOB) Program: <https://www.dla.mil/Aviation/Offers/Services/AviationEngineering/Engineering/ValueEng.aspx>

KEYWORDS: Nuclear Enterprise Support (NESO), Source Approval, Reverse Engineering

TPOC-1: Rhonda Blum
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TPOC-2: Denise Price
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DLA212-002 TITLE: Unique Identifier Tags for Supply Chain Tracking Modernization for Mark 39 Expendable Mobile Anti-Submarine Warfare (ASW) Training Target (EMATT)

RT&L FOCUS AREA(S): Warfighter Requirements (GWR)

TECHNOLOGY AREA(S): Ground Sea

The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), 22 CFR Parts 120-130, which controls the export and import of defense-related material and services, including export of sensitive technical data, or the Export Administration Regulation (EAR), 15 CFR Parts 730-774, which controls dual use items. Offerors must disclose any proposed use of foreign nationals (FNs), their country of origin, the type of visa or work permit possessed, and the statement of work (SOW) tasks intended for accomplishment by the FN(s) in accordance with section 3.5 of the Announcement. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws.

OBJECTIVE: Develop a new system to positively mark, scan, and uniquely identify the system and subsystem sections of EMATT vehicles.

DESCRIPTION: Developed as a low cost, expendable, open ocean training target, EMATT allows combined training of submarine, aircraft, & ship crews in search, detection & tracking of submarines. Its “A-size” sonobuoy shape means the target can be launched from surface ships or fixed and rotary winged aircraft. EMATT offers advanced ASW training capability with minimal maintenance, training, and logistics to operate and its expendability allows exercises to occur in littoral or blue waters, day or night, and in high or low sea-states. As the EMATT technology options expand, and production volumes increase, there exists a need for improved track and trace capability, at both the fully assembled system level, as well as the subsystem or section level. A unique tag technology, that could be visually and RFID scanned would allow for improved supply chain track and trace, not only at the OEM production facility, but also as EMATTs arrive at Navy distribution points, surface ships and submarines, and overseas deliveries for foreign military sales.

As innovations and new technologies are implemented into acoustic systems, tail section propulsion, payloads and sensors on this platform, it becomes increasingly complex to differentiate between the myriad of potential vehicle and section options, performance and endurance capabilities, and battery status and shelf life. A unique tag technology would simplify and confirm the mission set, when in use by operators in the field in preparation for deployment, launch and recovery.

PROJECT DURATION and COST:

PHASE I: NTE 12 Months \$150K- Base NTE \$100K base 6 Months, Option 1 NTE \$50K base 6 Months.

PHASE II: Phase II – NTE 24 Months \$1.6M - Base 18 months, \$1M Option 6 Months NTE \$.6M

PERIOD OF PERFORMANCE: The phase one period of performance is not to exceed 12 months total. Options are not automatic. Approval is at the discretion of the DLA SBIP Program Manager. The decision is based on Project Performance, Priorities of the Agency, and/or the availability of funding.

PHASE I: Goal of Phase I: Design a unique identifier tag technology for track and trace of modular UUV systems and subsystems throughout the production supply chain

- Identify present “state of the art” technologies available.

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- Establish both optical and electro-magnetic scanning approaches (identifying scanning ranges as well as abilities to scan through materials present in the EMATT hulls and systems).
- Demonstrate the tag technology's ability to provide UUV tracking and tracing throughout the production supply chain, mission use, and recovery.
- Document technology recommendations to be prototyped in Phase II

All Phase I Proposals should specify a mature technology capable of achieving the Phase I goals. Proposals that fail to demonstrate that they have a technology prepared to achieve the goals will be rejected.

PHASE II: Goal of Phase II: Develop and integrate prototype unique identifier tags technology for track and trace of modular UUV systems and subsystems

- Build QTY 25 prototype tags leveraging the resulting design from Phase I.
- Integrate prototype tags into system and subsystem components, perform pilot track and trace evaluation and testing
- Establish transition plan, and commercialization strategy

The Phase II proposal is optional for the Phase I awardee. Phase II selections are based on Phase I performance, SB engineering capability and innovation, the technical maturity of the proposed technology, as well as applicability to the requirement.

PHASE III DUAL USE APPLICATIONS: Phase III is any proposal that “Derives From”, “Extends” or Completes a transition from a Phase I or II project. Phase III proposals will be accepted after the completion of Phase I and or Phase II projects.

There is no specific funding associated with Phase III, except Phase III is not allowed to use SBIR/STTR coded funding. Any other type of funding is allowed.

Phase III proposal Submission. Phase III proposals are emailed directly to DLA SBIR2@dlamail. The PMO team will set up evaluations and coordinate the funding and contracting actions depending on the outcome of the evaluations. A Phase III proposal should follow the same format as Phase II for the content, and format. There are, however, no limitations to the amount of funding requested, or the period of performance. All other guidelines apply.

COMMERCIALIZATION: The SB will pursue commercialization of the various technologies and processes developed in prior phases through participation in future DLA procurement actions on items identified but not limited to this BAA.

REFERENCES:

1. A-Size Autonomous Underwater Vehicles web site: <https://www.lockheedmartin.com/en-us/products/a-size-autonomous-underwater-vehicles.html>

KEYWORDS: Track and Trace, Sonobuoy

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DLA212-003 TITLE: Thermoplastic forming of metallic glasses

RT&L FOCUS AREA(S): General Warfighting Requirements (GWR)

TECHNOLOGY AREA(S): Materials

The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), 22 CFR Parts 120-130, which controls the export and import of defense-related material and services, including export of sensitive technical data, or the Export Administration Regulation (EAR), 15 CFR Parts 730-774, which controls dual use items. Offerors must disclose any proposed use of foreign nationals (FNs), their country of origin, the type of visa or work permit possessed, and the statement of work (SOW) tasks intended for accomplishment by the FN(s) in accordance with section 3.5 of the Announcement. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws.

OBJECTIVE: Develop thermoplastic forming of metal components for military applications in aeronautical and space platforms.

DESCRIPTION: The Defense Logistics Agency (DLA) is looking for a domestic capability to manufacture metallic components rapidly and affordably with complex shapes for air and space platforms. Manufacturing such parts currently requires many steps, including forming, machining, and joining, that dramatically increase cost and delivery times, negatively impacting the logistic supply chain. Metallic glasses are a class of alloys with exceptional strength and hardness, and they are the only metallic materials that can be processed by thermoplastic methods such as injection molding and blow molding. These methods allow parts to be manufactured in seconds rather than days or weeks, and complex shapes are produced in a single step.

Initial work will identify candidate components that will benefit most from reduced manufacturing time and cost. R&D tasks include developing and demonstrating component design, die design and heating methods to manage the thermal budget specified by the metallic glass alloy being used. These efforts will be demonstrated on impactful applications in military air and space platforms. Applications that improve space access, mobility or logistics are especially desired. The processes developed should be scalable to commercially significant production rates.

PHASE I: The research and development goals of Phase I are to provide eligible Small Business firms the opportunity to successfully demonstrate the viability of manufacturing complex metallic aircraft and spacecraft components using thermoplastic forming methods such as blow forming and injection molding. The vendor will identify and prioritize candidate components, considering impact to mission capabilities and logistic concerns such as cost and production time. The main effort will be to conduct preliminary studies to propose details of manufacture, showing feasibility and benefit to the USAF or USSF. A plan to demonstrate the thermoplastic manufacture of metallic parts and address implementation approaches for near term insertion into Department of Defense (DoD) systems, subsystems, components, or parts will be included in the Phase I effort. Relationships with potential customers and systems integrators will be established to aid in component identification, guide design efforts, and support the impact and insertion analyses. The deliverables for this project will include a final report describing the results from these analyses.

Phase I – 6 Months \$100K

Phase II – 24 Months \$1.6M

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PHASE II: Based on the results of PHASE I, the research and development goals of PHASE II will demonstrate commercial viability by successfully producing target metallic components via thermoplastic processing. Tasks to be accomplished include component design, die design, development of design tools to manage the unique thermal budget provided by the selected metallic glass alloy, and design and production of heating systems. These tools will be used to produce the target components. Sufficient validation trials will be conducted to support analyses of manufacturing at commercial scale, including cost, cycle time and commercial benefit of the innovation. Remaining technical gaps will be identified. Manufactured components shall be used for component level testing. Innovative processes should be developed with the intent to readily transition to production in support of DoD needs. A partnership with a current or potential DoD supplier, OEM, or another suitable partner is highly desirable.

PHASE III DUAL USE APPLICATIONS: Phase III is any proposal that “Derives From”, “Extends” or Completes a transition from a Phase I or II project. Phase III proposals will be accepted after the completion of Phase I and or Phase II projects.

There is no specific funding associated with Phase III, except Phase III is not allowed to use SBIR/STTR coded funding. Any other type of funding is allowed.

Phase III proposal Submission. Phase III proposals are emailed directly to DLA SBIR2@dla.mil. The PMO team will set up evaluations and coordinate the funding and contracting actions depending on the outcome of the evaluations. A Phase III proposal should follow the same format as Phase II for the content, and format. There are, however, no limitations to the amount of funding requested, or the period of performance. All other guidelines apply.

COMMERCIALIZATION: The vendor will pursue commercialization of the thermoplastic forming of metallic glasses developed in prior phases, as well as potential commercial sales of any parts or other items.

REFERENCES:

1. <https://doi.org/10.1002/adma.200902776>
2. https://www.researchgate.net/publication/51120951_Beating_Crystallization_in_Glass-Forming_Metals_by_Millisecond_Heating_and_Processing
3. E. Pekarskaya and J Schroers, Development of Bulk Metallic Glass Components for Spacecraft Applications Using Thermoplastic Forming, AFRL-RX-WP-TR-2018-0262, <http://www.dtic.mil>

KEYWORDS: metallic glass, thermoplastic forming

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DLA212-004 TITLE: Rare Earth Metals Production

RT&L FOCUS AREA(S): General Warfighting Requirements (GWR)

TECHNOLOGY AREA(S): Materials

The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), 22 CFR Parts 120-130, which controls the export and import of defense-related material and services, including export of sensitive technical data, or the Export Administration Regulation (EAR), 15 CFR Parts 730-774, which controls dual use items. Offerors must disclose any proposed use of foreign nationals (FNs), their country of origin, the type of visa or work permit possessed, and the statement of work (SOW) tasks intended for accomplishment by the FN(s) in accordance with section 3.5 of the Announcement. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws.

OBJECTIVE: Develop, demonstrate, and stand up a rare earth metal production process. The process should be able to produce metal from commercially available oxides or carbonates. It should be scalable to meet changes in industrial demand. The price should be commercially viable. The major elements of interest are neodymium (Nd), praseodymium (Pr), gadolinium (Gd), samarium (Sm).

DESCRIPTION: DLA requires a domestic processing ability to produce rare earth metals from commercially available precursors. These materials are essential to a wide range of both essential civilian and military technologies. Domestic manufacturing of these material is essential for DLA to support the warfighter.

The process should be able to take multiple commercially available precursors and produce high purity metal. It must be environmentally compliant with all federal, state, and local laws. Ideally the process and equipment could be used for more than a single element.

The material should be at least 99.9% pure.

The process should be scalable and modular to allow for rapid scale up if necessary.

PHASE I: The below actions would be required to successfully accomplish Phase I:

- At a minimum, develop a process flow sheet and design a lab scale of material processed of at least 2kg to confirm its accuracy.
- Material produced at the required purity level.
- Breakdown of cost structure for industrialization including required capital expenditures and per unit production costs.

Phase I – 6 Months \$100K

Phase II – 24 Months \$1.6M

PHASE II: The below actions would be required to successfully accomplish Phase II:

- Deliver a lab scale prototype (TRL 6) with a minimal low-rate production for at least 1 of the listed materials.
- Using the metal produced to make a magnet alloy and test magnet blocks made from it.
- Detail a plan on how to increase to full commercial production for as many of the materials as is possible with the same hardware.

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- Outline the economic business case for full scale commercialization.

PHASE III DUAL USE APPLICATIONS: Phase III is any proposal that “Derives From”, “Extends” or Completes a transition from a Phase I or II project. Phase III proposals will be accepted after the completion of Phase I and or Phase II projects.

There is no specific funding associated with Phase III, except Phase III is not allowed to use SBIR/STTR coded funding. Any other type of funding is allowed.

Phase III proposal Submission. Phase III proposals are emailed directly to DLA SBIR2@dla.mil. The PMO team will set up evaluations and coordinate the funding and contracting actions depending on the outcome of the evaluations. A Phase III proposal should follow the same format as Phase II for the content, and format. There are, however, no limitations to the amount of funding requested, or the period of performance. All other guidelines apply.

PHASE III DUAL USE APPLICATIONS: these materials have dual-use commercial or military applications in many complex systems.

REFERENCES:

KEYWORDS: Rare Earth Metals, Reduction, Refining, Rare Earth Alloys

TPOC-1: Nathan Cardinell
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VERSION 2

DLA212-005 TITLE: Enhancing the separation technology to recover rare earths (REs) from chemical concentrates or industrial waste feedstock.

RT&L FOCUS AREA(S): General Warfighting Requirements (GWR)

TECHNOLOGY AREA(S): Materials

The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), 22 CFR Parts 120-130, which controls the export and import of defense-related material and services, including export of sensitive technical data, or the Export Administration Regulation (EAR), 15 CFR Parts 730-774, which controls dual use items. Offerors must disclose any proposed use of foreign nationals (FNs), their country of origin, the type of visa or work permit possessed, and the statement of work (SOW) tasks intended for accomplishment by the FN(s) in accordance with section 3.5 of the Announcement. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws.

OBJECTIVE: Develop, demonstrate, and stand up a rare earth separation and refining process. The process should be able to produce rare earth oxides (or similar) from commercially available RE concentrates, ores, or industrial waste feedstock. It should be scalable to meet changes in industrial demand. The price should be commercially viable.

DESCRIPTION: DLA R&D is looking for a domestic capability that demonstrates a new novel RE extraction and separation process from chemical concentrates, ores, or industrial waste feedstock. Defense weapon systems use various REs and there is currently no domestic production of these materials and therefore a risk of foreign reliance. Developing an economically viable, environmentally friendly process for enhancing the recovery of REs from the existing industrial waste feedstock, such as red mud, electronic devices, could facilitate the establishment of a viable, competitive domestic supply chain. DLA R&D seeks to prove the recovery demonstration for marketable REs from varied feedstock and facilitate commercialization of that process. R&D tasks include identifying feedstock sources in the existing domestic supply chain and developing process for extracting and processing the REs that demonstrates a significant cost advantage versus standard processing. It must be environmentally compliant with all federal, state, and local laws. Ideally the process and equipment could be used for more than a single element. The material should be at least 99.9% pure. The process should be scalable and modular to allow for rapid scale up if necessary.

PHASE I: The below actions would be required to successfully accomplish Phase I:

- At a minimum, develop a process flow sheet and design a lab scale of material processed of at least 2kg to confirm its accuracy.
- Material produced at the required purity level.
- Breakdown of cost structure for industrialization including required capital expenditures and per unit production costs.

Phase I – 6 Months \$100K

Phase II – 24 Months \$1.6M

PHASE II: The below actions would be required to successfully accomplish Phase II:

- Deliver a Lab scale prototype (TRL 6) with a minimal low-rate production for at least one of the rare earths and find a domestic supplier to reduce the rare earth oxide (REO) into metal/alloy.
- Detail a plan on how to increase to full commercial production for as many of the materials as is possible with the same hardware.

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- Outline the economic business case for full scale commercialization.

PHASE III DUAL USE APPLICATIONS: Phase III is any proposal that “Derives From”, “Extends” or Completes a transition from a Phase I or II project. Phase III proposals will be accepted after the completion of Phase I and or Phase II projects.

There is no specific funding associated with Phase III, except Phase III is not allowed to use SBIR/STTR coded funding. Any other type of funding is allowed.

Phase III proposal Submission. Phase III proposals are emailed directly to DLA SBIR2@dla.mil. The PMO team will set up evaluations and coordinate the funding and contracting actions depending on the outcome of the evaluations. A Phase III proposal should follow the same format as Phase II for the content, and format. There are, however, no limitations to the amount of funding requested, or the period of performance. All other guidelines apply.

These materials have dual-use commercial or military applications in many complex systems

REFERENCES:

KEYWORDS: Rare Earth Oxides, Concentrates, Red Mud, Reduction, Refining, Rare Earth Elements

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VERSION 2

DLA212-006 TITLE: Automation-Robotics to support/supplement Dining Facilities

RT&L FOCUS AREA(S): Autonomy; Artificial Intelligence/ Machine Learning; General Warfighting Requirements (GWR)

TECHNOLOGY AREA(S): Materials

The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), 22 CFR Parts 120-130, which controls the export and import of defense-related material and services, including export of sensitive technical data, or the Export Administration Regulation (EAR), 15 CFR Parts 730-774, which controls dual use items. Offerors must disclose any proposed use of foreign nationals (FNs), their country of origin, the type of visa or work permit possessed, and the statement of work (SOW) tasks intended for accomplishment by the FN(s) in accordance with section 3.5 of the Announcement. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws.

OBJECTIVE: Develop industry partnership with technology companies who are developing automated robotic solutions for food production, mechanized distribution on-site in a “ghost kitchen” environment, which supplement Back-of-the-House (BOH) operations to support Front-of-the-House (FOH) serving and dining operations. This project promotes the opportunity for industry technology to be developed, tested and potentially used in military food & beverage operations. Conduct market research on technology capable of assisting with the preparation, processing, and/or cooking of food. This research seeks to identify and test solutions to improve efficiency and will permit the Services to better allocate labor resources within military dining facilities. Added benefits of reducing food and life safety risks with robotics using “contactless” food preparation in situations such as COVID-19 should be a highlighted benefit.

DESCRIPTION: Defense Logistics Agency (DLA) Troop Support (TS) Subsistence topic of interest is research focused on the use of automation-robotics in dining facilities. This research shall cover the areas involving the preparation, processing, and cooking of food. Specific areas of interest include:

- Identify technology and robotic solutions which can be utilized to perform BOH tasks that prepare food for service in FOH dining systems
- Once identified, provide the characteristics/capabilities of the equipment and any solutions on how robotics could be used within Food & Beverage operations
- If your firm is currently developing this type of equipment, provide the function the equipment will be executing and any timeframe for commercial testing and production.

PHASE I: The research and development goals of Phase I are to provide Small Business eligible Research and Development firms the opportunity to successfully demonstrate how automation can be utilized in military dining facilities to reduce costs and increase efficiency. A concept of operations (CONOPs) or a process will be created by the vendor to show how the equipment can be utilized within the dining facilities. The deliverables for this project will include a final report to include a cost breakdown of the equipment to include, but not necessarily limited to, product cost, shipping, installation, training, parts kits, etc.

Phase I – 6 Months \$100K

Phase II – 24 Months \$1.6M

PHASE II: Based on the research and development results and the CONOPs developed during PHASE I, the research and development goals of PHASE II will emphasize the actual use of the equipment within a

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military dining facility at a location mutually agreed upon between DLA Troop Support Subsistence, the Vendor and the Military Partner.

PHASE III DUAL USE APPLICATIONS: Phase III is any proposal that “Derives From”, “Extends” or Completes a transition from a Phase I or II project. Phase III proposals will be accepted after the completion of Phase I and or Phase II projects.

There is no specific funding associated with Phase III, except Phase III is not allowed to use SBIR/STTR coded funding. Any other type of funding is allowed.

Phase III proposal Submission. Phase III proposals are emailed directly to DLA SBIR2@dla.mil. The PMO team will set up evaluations and coordinate the funding and contracting actions depending on the outcome of the evaluations. A Phase III proposal should follow the same format as Phase II for the content, and format. There are, however, no limitations to the amount of funding requested, or the period of performance. All other guidelines apply.

Progress documented from PHASE I and PHASE II should result in a vendor’s qualification as an approved source for automation-robotics to support and supplement Dining Facilities in future procurements.

COMMERCIALIZATION: The vendor will pursue commercialization of the various processes and technologies associated with the automation-robotics to support and supplement Dining Facilities project in prior phases as well as potential commercial sales of any parts or other items.

REFERENCES:

1. DoD Manual 1338.10, DoD Food Service Manual;
1. <http://www.dtic.mil/whs/directives/corres/pdf/133810m.pdf>
2. TB MED 530/NAVMED P-5010-1/AFMAN 48-147_IP, “Tri-Service Food Code,” October 7, 2013; <http://www.med.navy.mil/directives/Pub/5010-1.pdf>
3. Defense Logistics Agency: DLA Troop Support Subsistence. <https://www.dla.mil/TroopSupport/Subsistence.aspx>

KEYWORDS: automation-robotics, dining facilities

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VERSION 2

DLA212-007 TITLE: Research and Testing of a Robotic Arm Embedded with Artificial Intelligence (AI) for use within Defense Logistics Agency (DLA) Distribution Center Warehouses

RT&L FOCUS AREA(S): General Warfighter Requirements (GWR)

TECHNOLOGY AREA(S): Information Systems

The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), 22 CFR Parts 120-130, which controls the export and import of defense-related material and services, including export of sensitive technical data, or the Export Administration Regulation (EAR), 15 CFR Parts 730-774, which controls dual use items. Offerors must disclose any proposed use of foreign nationals (FNs), their country of origin, the type of visa or work permit possessed, and the statement of work (SOW) tasks intended for accomplishment by the FN(s) in accordance with section 3.5 of the Announcement. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws.

OBJECTIVE: Concept statement: DLA is exploring the use of robots to include robot arms to better understand what capability these machines provide to leverage human tasks in materiel handling. One approach DLA wants to explore is to incorporate Artificial Intelligence into individual robots to provide autonomy to resolve current issues in materiel handling.

Develop a Robotic Arm that utilizes an Artificial Intelligence (AI) solution (with deep learning if applicable) to provide a state-of-the-art capability to identify items, and pick, pack, and arrange picked items within selected boxes and operate within the DLA Distribution Warehouse environment. Additionally, the AI-embedded Robotic Arm must provide the adaptive pushing displacement required for the tight packing of items within shipping boxes, and must communicate with various warehouse systems (*e.g.*, Internet of Things (IoT)) as needed. The desired solution should minimize infrastructure modifications to enable the artificial intelligence embedded robotic arm to operate within the warehouse environment.

The goal of this effort is for the vendor to develop a capability an AI-embedded robotic arm system operating in the warehouse, that addresses the requirements for integrating with warehouse communications systems onsite (if required), such as the Warehouse Execution System (WES) at the specific warehouse. As such, this capability provides for the seamless execution of the AI-embedded Robotic Arm and its subsequent interactions with any future Smart Warehouse systems that may be developed and employed.

Provide a report with a detailed analysis that captures concepts on using robotics to include robotic arms which incorporate features of artificial intelligence. The study and analysis can include concepts and approaches that are innovative and may not be known from current market research, or individual development through industry or academia.

Prospective vendors should organize the objectives by priority as shown below:

- Explore using methods and schemes that allow for least cube space.
- How the robot system adapts or can be integrated into existing Warehouse Management System (WMS).
- How the robotic system seamlessly integrates into communications and equipment like current Internet of Things (IoT), 5G communications, and knowledge systems to manage warehouse operations.
- Future communications systems and equipment beyond 5G, and IoT.

The state-of-the-art AI-embedded Robotic Arm solution must integrate into the existing warehouse

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communications systems to communicate with the WES system to allow for the embedded AI Robotic Arm to receive automated tasking instructions to pick and pack boxes, crates, and bins and use AI to accurately identify boxes, cases, crates, and individual end-items using loaded configuration information and task instructions. The provided packing instructions will be pushed to the Robotic Arm by the WES. The robotic arm should be able to operate continually as needed, and report back to the WES on the programmed Robotic Arm's task success or failure.

At a minimum, the prospective vendors should:

- Explore what systems in a robotic arm or other mechanism can offer the best way to identify materiel correctly that matches with materiel transaction requests (i.e., machine vision).
- Recommend methods and schemes that impact or complement robotic functionality like accurate transactions using block chain.
- Discuss methods where robots and robotic arms adapt to random materiel requests regardless of timeframe, location, or item request.
- Discuss methods and schemes as to the flexibility of robot tasks that mimic human tasks like packing, moving parts and equipment, wrapping, and other tasks in warehouse operations.

In support of routine warehouse robotic arm operations, this research seeks to identify and test a Robotic Arm utilizing AI technology used to intelligently pack boxes within the DLA distribution warehouse environment. Importantly, the selected vendor must address the DLA-identified cybersecurity requirements by testing and evaluating the government's security control. The vendor should leverage the current technologies found in both the Robotic Arm and the AI industries. This research project will operate in locations at designated DLA Distribution Centers in the United States.

DESCRIPTION: Defense Logistics Agency (DLA) Distribution Modernization Program (DMP) topics of interest are research focused on a Continental United States-based robotic arm with an Artificial Intelligence (AI) solution in support of the routine warehouse end-item picking for box packing operations. The resulting solution must be integrated with existing WES communications suites and integrate with warehouse navigation systems, that:

1. Supports a joint effort between DLA Research and Development (R&D) and DLA J4 Distribution Headquarters to conduct research and test an AI-embedded warehouse Robotic Arm system that works during warehouse operations.
2. Significantly addresses an AI-embedded Robotic arm's capabilities within an operational distribution warehouse environment.
3. Features an AI-embedded Robotic Arm that can implement repetitive box packing tasks with high precision and accuracy for regular use in warehouse operations.
4. Can be integrated into warehouse communications systems such as a WES to receive tasking and report on performance status.
5. Demonstrates a state-of-the-art operational capability when operating within the distribution warehouse environment through the application of AI-embedded Robotic Arm technology and seamlessly integrates with robust communications network technologies in a distribution warehouse environment shared with warehouse workers.
6. Provides for a reliable and robust technology solution that allows DLA Distribution Warehouses to perform automated tasks without significantly lowering operating speeds per existing industry trends.
7. Demonstrates compatibility with a Government data cloud environment to store and retrieve warehouse-generated data without relying on a separate commercial data cloud environment to navigate successfully.
8. Conclusively demonstrates the use of new AI technology and concepts for application and integration with a Robotic Arm to improve the distribution and delivery of material and goods during representative distribution warehouse operations in an innovative way.
9. All robotic/AI software control remains within the DLA server and does not

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transfer/communicate out to a vendor server.

10. Robotic arm needs to safely maneuver around humans without the need of a safety cage.

PHASE I: Perform a design study to determine how to use a robotic arm that utilizes artificial intelligence to optimize DLA Distribution Warehouse operations, sustainment, and logistics support. Deliver a final design of a Robotic Arm with AI capability, a simulation model of DLA Distribution assets, and a demonstration of an AI-infused Robotic Arm model capable of making intelligent trade-off decisions to meet specified PM requirements. A successful design optimizes support, minimizes DLA Distribution Warehouse system downtime, and maximizes system availability using logistics inputs (component failure rates, shipping times, repair times, maintenance man-hours, and warehouse staffing).

The SBIR Phase I expectation is to provide and successfully demonstrate how their proposed AI-embedded Robotic Arm concept of operations (CONOPS) improves the packing and arrangement of boxes. This automation provides for the more efficient distribution of goods and materials within the DLA distribution enterprise and effectively lessens the time to provide needed supplies to the Warfighter. The selected vendor will conduct a feasibility study to:

1. Address the requirements described above in the Description Section for AI-embedded Robotic Arm operations.
2. Identify capability gap(s) and the requirement for DLA to use an AI-embedded Robotic Arm in the DLA Distribution Operations environment.
3. Develop the vendor's Concept of Operations (CONOPS) to utilize an AI-embedded Robotic Arm and clearly describe how the requirements develop.

The vendor must create a CONOPS for an AI-embedded Robotic Arm to support both routine and wartime distribution warehouse operations. The concept of operations covers the utilization of artificial intelligence with Robotic Arms within DLA distribution warehouses during routine box packing procedures, precisely describing all operational requirements as part of this process.

The vendor must provide a CONOPS that includes the following tasks:

- Picking, placing, and relocating items where needed
- Perform packing operations mimicking human actions to complete the same steps.
- Wrapping tasks to protect materiel, food, perishables, or consumables.
- Distinguish in how to perform operations that have hazardous materials, or containers with volatile, caustic, corrosive, or possible explosive content.
- Other operations in a warehouse as may be described with end users.

This project's deliverables include a final report, including a cost breakdown of the proposed courses of action (COAs).

Phase I – 6 Months \$100K

Phase II – 24 Months \$1.6M

PHASE II: Based on the research and the concept of operations developed during Phase I, Phase II's research and development goals emphasize the development of the AI-embedded Robotic Arm system following the typical DLA Distribution Warehouse concept of operations for materiel handling. During Phase II, the vendor will:

1. Address the specific user requirements, functional requirements, and system requirements as defined and provided by DLA.
2. Develop a prototype AI-embedded Robotic Arm system for Developmental Test and Evaluation (DT&E) and Operational Test and Evaluation (OT&E).

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3. Implement government cybersecurity controls in the prototype design, and secure all necessary cybersecurity certifications to operate the AI-embedded Robotic Arm equipment in the DLA warehouse environment with DOD cloud connections.

The DLA AI-embedded Robotic Arm system will operate across the United States at various DLA Distribution Center sites mutually agreed upon between DLA R&D and DLA Distribution HQ. This project's deliverables include a final report, including a cost breakdown of courses of action (COAs).

PHASE III DUAL USE APPLICATIONS: Phase III is any proposal that “Derives From”, “Extends” or Completes a transition from a Phase I or II project. Phase III proposals will be accepted after the completion of Phase I and or Phase II projects.

There is no specific funding associated with Phase III, except Phase III is not allowed to use SBIR/STTR coded funding. Any other type of funding is allowed.

Phase III proposal Submission. Phase III proposals are emailed directly to DLA SBIR2@dla.mil. The PMO team will set up evaluations and coordinate the funding and contracting actions depending on the outcome of the evaluations. A Phase III proposal should follow the same format as Phase II for the content, and format. There are, however, no limitations to the amount of funding requested, or the period of performance. All other guidelines apply.

During Phase I and Phase II, the progress made should result in a vendor's qualification as an approved source for an AI-embedded Robotic Arm system and support participation in future procurements.

COMMERCIALIZATION: The manufacturer will pursue the commercialization of the AI-embedded Robotic Arm technologies and designs developed to apply to the warehouse environment-- the processes developed in preliminary phases and potential commercial sales of manufactured mechanical parts or other items. The first path for commercial use is at DLA's twenty-six Distribution Centers and twenty Disposition Centers. When fielded, DLA estimates 20 - 26 units, but the number of units could be more.

REFERENCES:

1. J. J. Enright and P. R. Wurman, "Optimization and Coordinated Autonomy in Mobile Fulfillment Systems," in AAAIWS'11-09, 2011.
2. F. Wang and K. Hauser, "Stable bin packing of non-convex 3d objects with a robot manipulator," in IEEE ICRA, 2019, pp. 8698–8704.
3. F. Wang and K. Hauser, "Robot packing with known items and nondeterministic arrival order," in R: SS, 2019.
4. A. Sahbani, S. El-Khoury, and P. Bidaud, "An Overview of 3D Object Grasp Synthesis Algorithms," RAS, vol. 60, no. 3, 2012.

KEYWORDS: Artificial Intelligence, AI, Robotic Arm, Wi-Fi, Warehouse, Distribution, Logistics, Simulation, Modeling and Simulation, Sustainment, Availability, Reliability, Picking, Packing, Maintainability, Supportability, Software Development, Machine Learning, Neural Networks, Real-time Computational Intelligence, Data Science, Software Architecture, Deep Learning.

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